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## Occurrence of *Holaspulus* (Acarina, Gamasida, Parholaspididae) in the Philippines<sup>1)</sup>

By

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**Abstract** Eight species of mites belonging to the genus *Holaspulus* are dealt with. Seven of them are new to science, and the remaining one, *H. tenuipes* (BERLESE), is recorded for the first time from the Philippines.

From July to September, 1985, a zoological expedition was made by the National Science Museum, Tokyo, to the Philippine Islands, Luzon, Mindanao, Palawan and Mindro. Participating in this expedition, the author investigated the fauna of free-living or phoretic gamasid mites, and collected many specimens from the litter layer by using modified Tullgren apparatus.

Of the family Parholaspididae, the author (1987) already reported two species of the genus *Proparholaspulus* from the Philippines. In this paper, he will deal with the genus *Holaspulus*. This genus was originally erected by BERLESE (1904) for *Holostaspis* (*Holaspulus*) *tenuipes* from a greenhouse in Italy, and was known only from greenhouses in Europa, till the time when EVANS (1956) described *H. tweediei* from inside a rotten tree at Singapore. In 1979, *H. tenuipes* was recorded by the present author from litter of warm-temperate forests in Japan.

In the present paper, seven new species and one species new to the Philippine fauna will be reported, that is, *Holaspulus apoensis* sp. nov., *H. primitivus* sp. nov., *H. silvestris* sp. nov., *H. epistomatus* sp. nov., *H. palawanensis* sp. nov., *H. luzonicus* sp. nov., *H. sclerus* sp. nov., and *H. tenuipes* BERLESE. The type series designated in this study are deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo. Some duplicate specimens are retained in the collection of the Laboratory of Biology, Matsuyama Shinonome College, Matsuyama, and the National Museum of the Philippines, Manila.

Before going further, the author wishes to express his hearty thanks to Dr. Hiroyuki MORIOKA, under whose leadership the expedition was carried out, to Mr. Masaki TOMOKUNI, Dr. Mamoru OWADA, Prof. Yoshiaki NISHIKAWA and Dr. Masahiro SAKAI, all of whom participated in the expedition, and to the staff of the National Museum of the Philippines for carrying out the research. Deep gratitude is also

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### Key to the Philippino Species of *Holaspulus*

1. Dorsal shield provided with 30 pair of setae .....2
- Dorsal shield provided with less than 29 pair of setae .....5
2. Dorsal shield minutely reticulated throughout .....*H. apoensis* sp. nov.
- Dorsal shield roughly reticulated at lateral and posterior portions.....3
3. Dorsal setae *z1* extremely short; expulsory vesicles of female present .....  
..... *H. tenuipes* BERLESE
- Dorsal setae *z1* long; expulsory vesicles of female absent .....7
4. Median extension of epistome long; sternal shield without reticulation .....  
..... *H. primitivus* sp. nov.
- Median extension of epistome short; sternal shield ornamented with reticulation  
..... *H. silvestris* sp. nov.
5. Dorsal shield provided with 29 pair of setae; tarsus I of male provided with claws  
and pulvilli .....6
- Dorsal shield provided with 28 pair of setae; tarsus I of male with neither claws  
nor pulvilli .....7
6. Median extension of epistome extremely long .....*H. epistomatus* sp. nov.
- Median extension of epistome short .....*H. palawanensis* sp. nov.
7. Median extension of epistome long; middle part of sternal shield minutely re-  
ticulated .....*H. luzonicus* sp. nov.
- Median extension of epistome short; middle part of sternal shield not reticulated  
but smooth .....*H. sclerus* sp. nov.

### *Holaspulus apoensis* sp. nov.

(Figs. 1 A–D, 8 A)

*Female.* Length of idiosoma av. 613  $\mu\text{m}$ ; width of idiosoma av. 445  $\mu\text{m}$ ; length of dorsal shield with a range of 557–610  $\mu\text{m}$ , av. 575  $\mu\text{m}$ ; width of dorsal shield at the level of coxa IV with a range of 350–395  $\mu\text{m}$ , av. 381  $\mu\text{m}$ ; light brown in colour.

*Dorsum.* Dorsal shield strongly sclerotized, and ornamented with minute reticulations throughout. Dorsal shield provided with 30 pair of setae, which are spatulate distally except for long simple setae *z1*, and with 22 pair of pores. Length of setae (holotype): verticals 48  $\mu\text{m}$ , *j2* 47  $\mu\text{m}$ , *j3* 46  $\mu\text{m}$ , *j4* 42  $\mu\text{m}$ , *j5* 38  $\mu\text{m}$ , *j6* 42  $\mu\text{m}$ , *J1* 43  $\mu\text{m}$ , *J3* 25  $\mu\text{m}$ , *J6* 48  $\mu\text{m}$ , *z1* 35  $\mu\text{m}$  and humerals 59  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 1 A.

*Venter.* Tritosternum bipartite, a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shields free, consisting of a pair of narrow platelets.

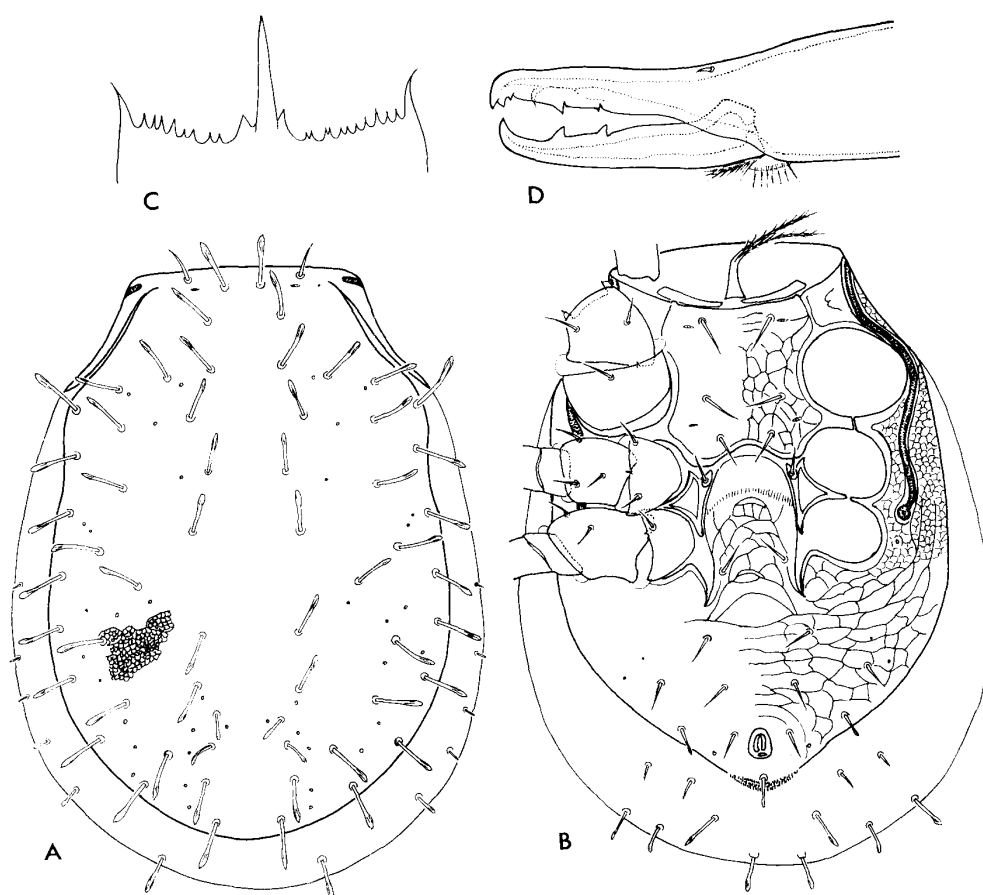


Fig. 1. *Holaspulus apoensis* sp. nov., female. — A, Dorsum; B, venter; C, epistome; D, chelicera.

Sternal shield sclerotized and ornamented with a network of ridges, roughly in middle part. Sternal setae I longer than setae II and III, setae III lying well inside the bases of setae II. Metasternal shields fused with endopodal shields, and provided with a pair of simple setae and pores. Epigynial shield reticulated, and fused posteriorly with ventri-anal shield, bearing a pair of simple setae. Ventri-anal shield reticulated, fused with epigynial, podal-peritrematal shields, and provided with four pair of preanal setae and three perianal ones, of which the postanal seta and a pair of preanal ones are spatulate distally. Interscutal membrane between dorsal and ventral shields provided with twelve pair of spatulate setae. Metapodal shields absent. Sitgmata situated near the antero-lateral angles of coxae IV. Peritremes extending to coxae I.

Gnathosoma. Epistome consisting of elongated median extension, and with several short spines and elongated lateral projections on either side. Palpal apotele bearing three tines, two of which are spatulate distally. Fixed digit of chelicera provided with one large and three small teeth and a pilus dentilis, while the movable digit ( $145\ \mu\text{m}$ ) is bidentate and longer than corniculus ( $125\ \mu\text{m}$ ). Salivary stylus ( $122\ \mu\text{m}$ ) well developed. Length of anterior hypostomatic seta  $65\ \mu\text{m}$ , external posterior hy-

postomatic seta 33  $\mu\text{m}$ , internal posterior hypostomatic seta 39  $\mu$  and deutosternal seta 30  $\mu\text{m}$ .

**Legs.** Tarsus I without claws and pulvilli; tarsus I (190  $\mu\text{m}$ ) more than twice the length of tibia I (80  $\mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae) 632  $\mu\text{m}$ , II 536  $\mu\text{m}$ , III 438  $\mu\text{m}$  and IV 590  $\mu\text{m}$ .

**Male.** Unknown.

**Type series.** Holotype ♀ (NSMT-Ac 10412), ex litter of tropical rain forest, Eagle Center, 1,100 m alt., Baracatan, N slope of Mt. Apo, Mindanao Is., 19-VIII-1985, K. ISHIKAWA. Paratypes: 4 ♀♀, same data as the holotype; 5 ♀♀, ex litter of tropical rain forest, Eagle Center, 1,600 m alt., Baracatan, N slope of Mt. Apo, Mindanao Is., 4-VIII-1985, K. ISHIKAWA.

**Remarks.** The present species is easily distinguished from other species of the genus by having dorsal shield ornamented with minute reticulations. It can be readily discriminated from *H. primitivus* sp. nov., from Palawan Is., by the following characteristic features: sternal shield ornamented with a network of ridges, instead of lacking in such a network.

### *Holaspulus tenuipes* BERLESE

*Holostaspis (Holaspulus) tenuipes* BERLESE, 1904, *Redia*, 1: 266.

*Holaspulus tenuipes*: EVANS, 1956, *Proc. zool. Soc. London*, 127: 354; KRANTZ, 1960, *Acarologia*, 2: 399; ISHIKAWA, 1979, *Bull. natn. Sci. Mus., Tokyo*, (A), 5: 258.

**Specimens examined.** 2 ♀♀, 2 ♂♂, ex litter of *Casuarina* sp., Baguio, 1,500 m alt., Benguet Prov., Luzon Is., 9-VII-1985, K. ISHIKAWA.

**Remarks.** This species was originally described by BERLESE (1904) from a greenhouse in Italy. Later, it was recorded from Switzerland and England, but only from greenhouses. It was first recorded from the field in Japan by the author (1979), and is found for first time in the Philippines.

### *Holaspulus primitivus* sp. nov.

(Figs. 2 A-G, 8 B)

**Female.** Length of idiosoma av. 619  $\mu\text{m}$ ; width of idiosoma av. 465  $\mu\text{m}$ ; length of dorsal shield with a range of 587–620  $\mu\text{m}$ , av. 603  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 410–465  $\mu\text{m}$ , av. 441  $\mu\text{m}$ ; light brown in colour.

**Dorsum.** Dorsal shield sclerotized and ornamented with reticulations in lateral and posterior portions. Dorsal shield provided with 30 pair of setae, which are spatulate distally with the exception of long simple setae *z1*, and with 21 pair of pores. Length of setae (holotype): verticals 48  $\mu\text{m}$ , *j2* 43  $\mu\text{m}$ , *j3* 44  $\mu\text{m}$ , *j4* 43  $\mu\text{m}$ , *j5* 33  $\mu\text{m}$ , *j6* 43  $\mu\text{m}$ , *J1* 43  $\mu\text{m}$ , *J3* 28  $\mu\text{m}$ , *J6* 55  $\mu\text{m}$ , *z1* 47  $\mu\text{m}$ , and humerals 75  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 3 A.

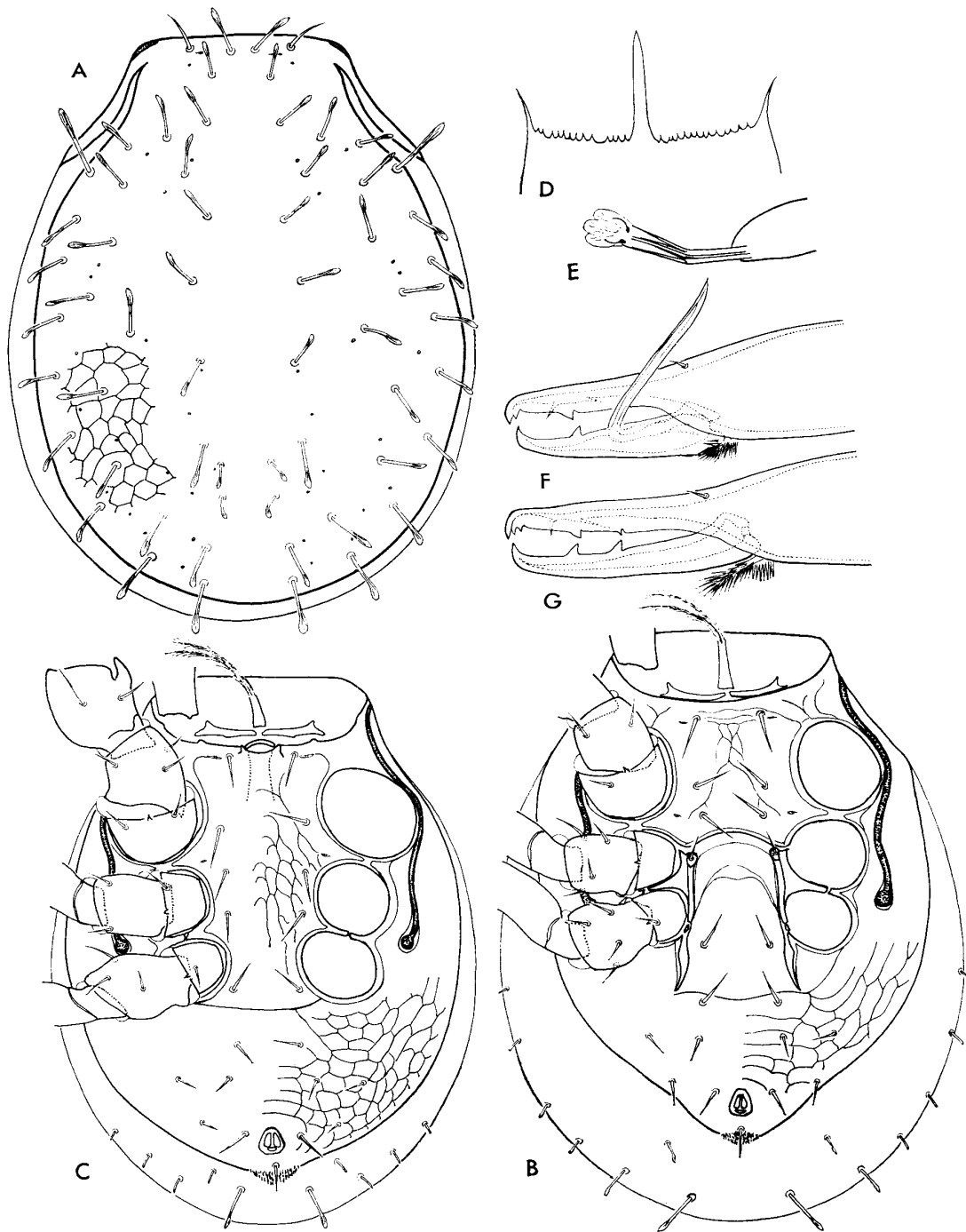


Fig. 2. *Holaspulus primitivus* sp. nov. (A–B, D, G, female; C, E–F, male). — A, Dorsum; B–C, venter; D, epistome; E, claws of tarsus I; F–G, chelicera.

**Venter.** Tritosternum bipartite, a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shield consisting of a pair of narrow platelets, and partly fused with sternal shield. Sternal shield sclerotized, without reticulations, and

with three pair of simple setae and two pair of lyrifissures. Metasternal shield fused with endopodal shields, and provided with a pair of simple setae and pores. Epigynial shield smooth, fused posteriorly with ventri-anal shield, and with a pair of simple setae. Ventri-anal shield reticulated, fused with epigynial, podal-peritrematal shields, and with four pair of preanal setae and three perianal ones. Intersutal membrane between dorsal and ventral shields provided with seven pair of spatulate setae. Metapodal shields absent. Stigmata located at a position antero-lateral to coxae IV. Peritremes extending to coxae I.

**Gnathosoma.** Epistome consisting of elongated median and lateral extensions, and with denticulated anterior margin. Palpal apotele bearing three tines, two of which are spatulate distally. Fixed digit of chelicera provided with one large and three small teeth and a pilus dentilis, while the movable digit (155  $\mu\text{m}$ ) is bidentate and longer than corniculus (101  $\mu\text{m}$ ). Salivary stylus (152  $\mu\text{m}$ ) well developed. Length of anterior hypostomatic seta 82  $\mu\text{m}$ , external posterior hypostomatic seta 40  $\mu\text{m}$ , internal posterior hypostomatic seta 52  $\mu\text{m}$  and deutosternal seta 31  $\mu\text{m}$ .

**Legs.** Tarsus I without claws and pulvilli; tarsus I (194  $\mu\text{m}$ ) approximately twice the length of tibia I (98  $\mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae) 652  $\mu\text{m}$ , II 565  $\mu\text{m}$ , III 487  $\mu\text{m}$  and IV 593  $\mu\text{m}$ .

**Male.** Length of idiosoma av. 563  $\mu\text{m}$ ; width of idiosoma av. 414  $\mu\text{m}$ ; length of dorsal shield with a range of 515–600  $\mu\text{m}$ , av. 551  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 385–425  $\mu\text{m}$ , av. 407  $\mu\text{m}$ .

Dorsal chaetotaxy and ornamentation similar to those of female. Presternal shields free, consisting of a pair of narrow platerlets. Sterniti-genital portion sclerotized, and with five pair of simple setae. Ventri-anal portion reticulated and with four pair of simple setae and three perianal ones. Fixed digit of chelicera bidentate; movable digit (120  $\mu\text{m}$ ) unidentate and approximately equal in length to spermatodactyl (118  $\mu\text{m}$ ). Tarsus I provided with vestigial claws and pulvilli. Femur II with a large thumb-like spur and genu II with two small spurs. Length of legs in the allotype: I (excl. pretarsus) 688  $\mu\text{m}$ , II 527  $\mu\text{m}$ , III 469  $\mu\text{m}$  and IV 610  $\mu\text{m}$ .

**Type series.** Holotype ♀ (NSMT-Ac 10413) and allotype ♂ (NSMT-Ac 10414), ex litter of tropical rain forest, Matalangao, 150 m alt., nr. Roxas, Palawan Is., 29–VIII–1985, K. ISHIKAWA. Paratypes: 10 ♀♀, 10 ♂♂, same data as holotype.

**Remarks.** As the tarsus I of the male is provided with vestigial claws and pulvilli, the present species is similar to *H. silvestris* sp. nov. from Mt. Puguis, Luzon Is., but the former is discriminated from the latter by the following points: median extension of epistome elongated, instead of being short; movable digit of male chelicera approximately equal in length to spermatodactyl, instead of being twice as long as the length of spermatodactyl.

***Holaspulus silvestris* sp. nov.**

(Figs. 3 A–G, 8 C)

*Female.* Length of idiosoma av. 544  $\mu\text{m}$ ; width of idiosoma av. 296  $\mu\text{m}$ ; length of dorsal shield with a range of 462–530  $\mu\text{m}$ , av. 489  $\mu\text{m}$ ; width of dorsal shield with a

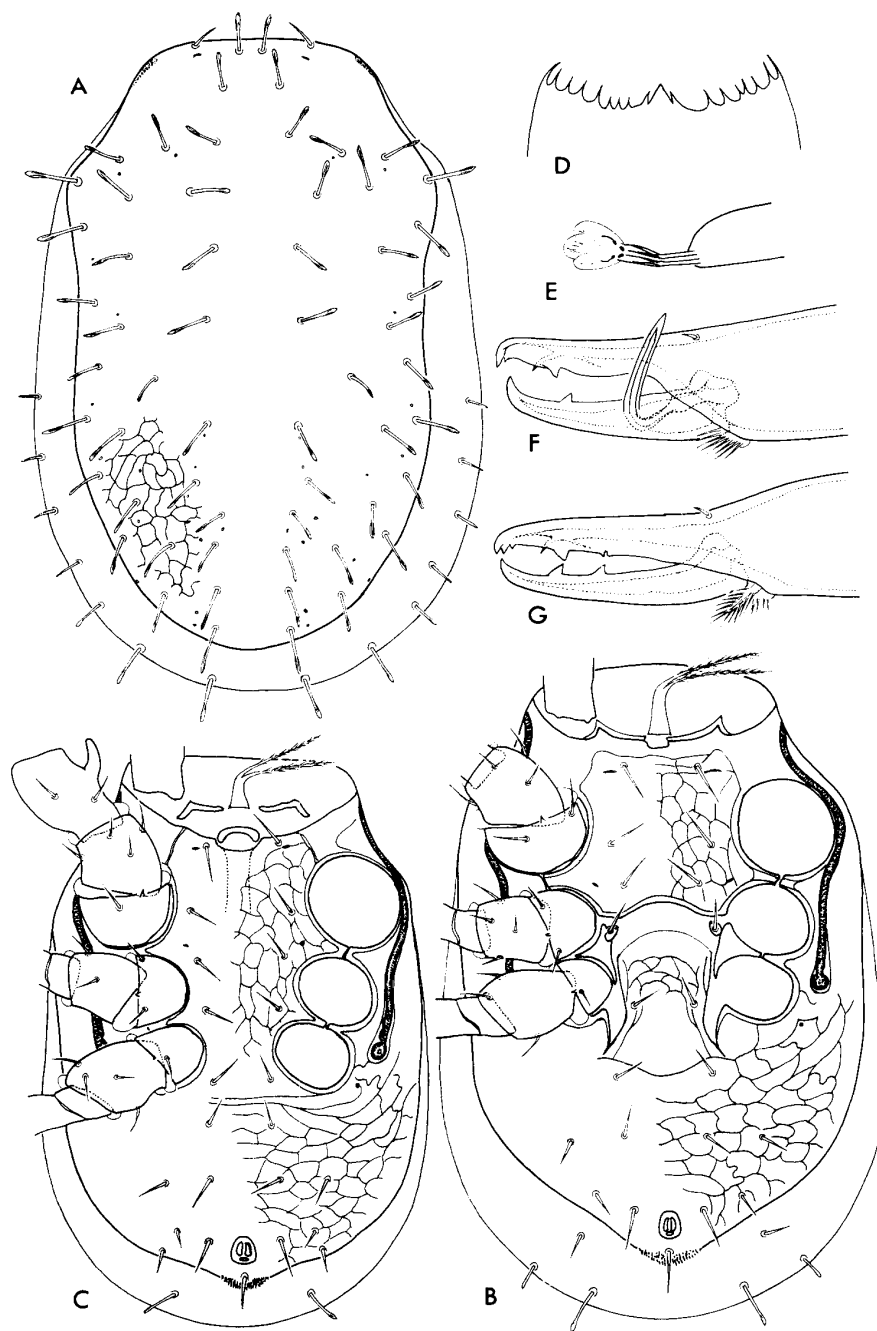


Fig. 3. *Holaspulus silvestris* sp. nov. (A–B, D, G, female; C, E–F, male). — A, Dorsum; B–C, venter; D, epistome; E, claws of tarsus I; F–G, chelicera.

range of 258–330  $\mu\text{m}$ , av. 284  $\mu\text{m}$ ; light brown in colour.

**Dorsum.** Dorsal shield sclerotized and reticulated, especially in lateral and posterior thirds; anterior margin truncated. Dorsal shield provided with 30 pair of setae, of which the setae *z1* are long and simple, and the remainings are spatulate distally, and with 19 pair of pores. Length of setae (holotype): verticals *j2* 28  $\mu\text{m}$ , *j3* 26  $\mu\text{m}$ , *j4* 30  $\mu\text{m}$ , *j5* 26  $\mu\text{m}$ , *j6* 29  $\mu\text{m}$ , *J1* 29  $\mu\text{m}$ , *J3* 20  $\mu\text{m}$ , *J6* 33  $\mu\text{m}$ , *z1* 28  $\mu\text{m}$  and humerals 37  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 3 A.

**Venter.** Tritosternum bipartite, a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shields fused with sternal shield. Sternal shield sclerotized and ornamented with a network of ridges, and with three pair of simple setae and two pair of lyrifissures. Metasternal shields partially fused with endopodal shield, and provided with a pair of simple setae and pores. Epigynial shield fused posteriorly with ventri-anal shield and with a pair of simple setae. Ventri-anal shield reticulated, and fused with epigynial, podal and peritrematal shields, and with four pair of preanal and three perianal setae. Interscutal membrane between dorsal and ventral shields bearing seven pair of spatulate and four pair of simple setae. Metapodal shields absent. Stigmata located at a position lateral to coxae IV. Peritremes extending to coxae I.

**Gnathosoma.** Epistome formed by a spinose median projection, with several short spines on either side of the median projection. Palpal apotele bearing three tines, two of which are spatulate distally. Fixed digit of chelicera provided with one large and three small teeth and a pilus dentilis, while the movable digit (97  $\mu\text{m}$ ) is bidentate and slightly longer than corniculus (90  $\mu\text{m}$ ). Salivary stylus (93  $\mu\text{m}$ ) well developed. Length of anterior hypostomatic seta 68  $\mu\text{m}$ , external posterior hypostomatic seta 28  $\mu\text{m}$ , internal posterior hypostomatic seta 35  $\mu\text{m}$  and deutosternal seta 24  $\mu\text{m}$ .

**Legs.** Tarsus I with neither claws nor pulvilli; tarsus I (150  $\mu\text{m}$ ) more than twice the length of tibia I (71  $\mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae) 496  $\mu\text{m}$ , II 408  $\mu\text{m}$ , III 315  $\mu\text{m}$  and IV 420  $\mu\text{m}$ .

**Male.** Length of idiosoma av. 425  $\mu\text{m}$ ; width of idiosoma av. 277  $\mu\text{m}$ ; length of dorsal shield 405, 418, 450  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV 235, 240, 262  $\mu\text{m}$ .

The chaetotaxy and ornamentation of dorsal shield are essentially the same as in the female. Holoventral shield reticulated, sterniti-genital portion provided with five pair of setae, ventri-anal portion with four pair of preanal and three perianal setae, all simple. Fixed digit of chelicera bidentate; movable digit (82  $\mu\text{m}$ ) unidentate and approximately twice as long as spermatodactyl (42  $\mu\text{m}$ ). Tarsus I with vestigial claws and pulvilli, while tarsi II to IV each with well developed claws and pulvilli. Femur II with a large thumb-like spur, and genu, tibia and tarsus II each with a small spur. Length of legs in the allotype I 478  $\mu\text{m}$ , II 402  $\mu\text{m}$ , III 325  $\mu\text{m}$  and IV 430  $\mu\text{m}$ .



*Type series.* Holotype ♀ (NSMT-Ac 10415) and allotype ♂ (NSMT-Ac 10416), ex litter of warm temperate forest, Mt. Puguis, 2,000 m alt., Mountain Prov., Luzon Is., 18-VII-1985, K. ISHIKAWA. Paratypes: 3 ♀♀, 2 ♂♂, same data as holotype; 3 ♀♀, ex moss on rotten trees, Mt. Pangao, 2,340 m alt., nr. Mt. Data, Mountain Prov., Luzon Is., 26-VII-1985, K. ISHIKAWA.

*Remarks.* The present species is closely related to *H. primitivus* sp. nov., from Matalangao, Palawan Is., in the tarsus I of male provided with vestigial claws and pulvilli, but is distinguished from the latter by the following points: median extension of epistome short, instead of being elongated; movable digit of male chelicera approximately twice as long as spermatodactyl, instead of being approximately equal in length.

***Holaspulus epistomatus* sp. nov.**

(Figs. 4 A–G, 8 D)

*Female.* Length of idiosoma av. 816  $\mu\text{m}$ ; width of idiosoma av. 647  $\mu\text{m}$ ; length of dorsal shield with a range of 780–835  $\mu\text{m}$ , av. 800  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 582–620  $\mu\text{m}$ , av. 607  $\mu\text{m}$ ; light brown in colour.

*Dorsum.* Dorsal shield sclerotized and ornamented with reticulations in the lateral and posterior portions. Dorsal shield bearing 29 pair of setae, of which 28 pairs are spatulate distally, and remaining setae *z1* are long and simple, and with 22 pair of pores. Length of setae (holotype): verticals 70  $\mu\text{m}$ , *j2* 75  $\mu\text{m}$ , *j3* 63  $\mu\text{m}$ , *j4* 58  $\mu\text{m}$ , *j5* 58  $\mu\text{m}$ , *J1* 60  $\mu\text{m}$ , *J3* 51  $\mu\text{m}$ , *J5* 75  $\mu\text{m}$ , *z1* 52  $\mu\text{m}$  and humerals 95  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 4 A.

*Venter.* Tritosternum bipartite; a pair of pilose laciniae more than twice longer than tritosternal base. Preseternal shields free, consisting of a pair of narrow platelets. Sternal shield sclerotized and ornamented with reticulated pattern, which is particularly minute in middle portion, and with three pair of simple setae and two pair of lyrifissures. Metasternal shields free, and provided with a pair of simple setae and pores. Epigynial shield minutely reticulated, and with a pair of simple setae. Ventri-anal shield reticulated, fused with epigynial, podal-peritrematal shields, and with four pair of preanal setae and three perianal ones. Metapodal shields absent. Interscutal membrane between dorsal and ventral shields provided with eight pair of spatulate setae. Stigmata situated antero-lateral to coxae IV. Peritremes extending to coxae I.

*Gnathosoma.* Epistome consisting of a remarkably elongated median extension, and with several short spines and elongated lateral projections on either side. Palpal apotele bearing three tines, two of which are spatulate distally. Fixed digit of chelicera provided with one large, three small teeth, and a pilus dentilis, while movable digit (155  $\mu\text{m}$ ) is bidentate and longer than corniculus (135  $\mu\text{m}$ ). Salivary stylus (125  $\mu\text{m}$ ) well developed. Length of anterior hypostomatic seta 123  $\mu\text{m}$ , external posterior hypostomatic seta 81  $\mu\text{m}$ , internal posterior hypostomatic seta 95  $\mu\text{m}$

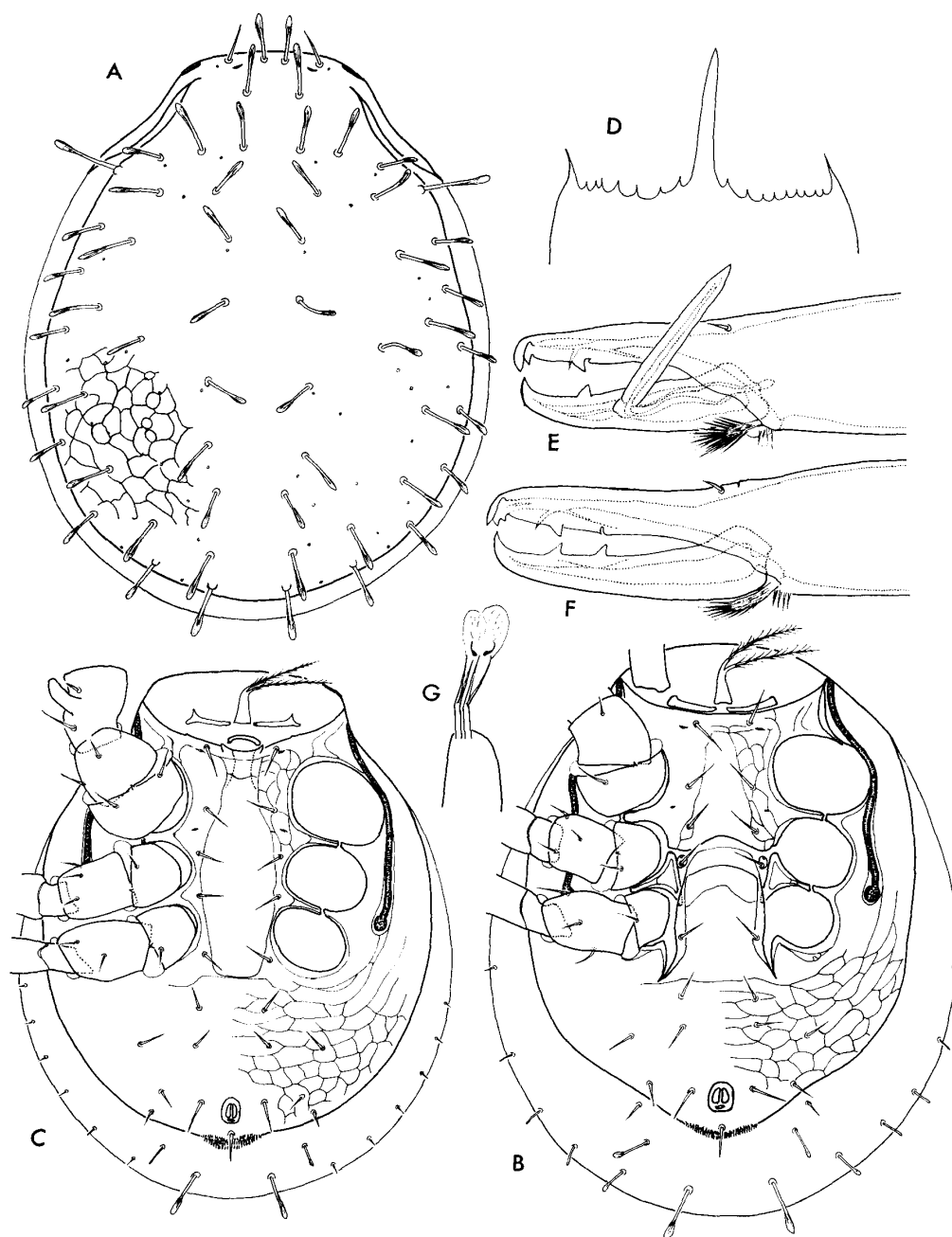


Fig. 4. *Holaspulus epistomatus* sp. nov. (A–B, D, F, female; C, E, G, male). — A, Dorsum; B–C, venter; E–F, chelicera; G, claws of tarsus I.

and deutosternal seta  $48\ \mu\text{m}$ .

Legs. Tarsus I without claws and pulvilli; tarsus I ( $241\ \mu\text{m}$ ) more than twice the length of tibia I ( $113\ \mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae)  $774\ \mu\text{m}$ , II  $635\ \mu\text{m}$ , III  $618\ \mu\text{m}$  and IV  $845\ \mu\text{m}$ .

**Male.** Length of idiosoma av. 729  $\mu\text{m}$ ; width of idiosoma av. 578  $\mu\text{m}$ ; length of dorsal shield with a range of 670–685  $\mu\text{m}$ , av. 712  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 530–580  $\mu\text{m}$ , av. 552  $\mu\text{m}$ .

Dorsal chaetotaxy and ornamentation similar to those of female. Sterniti-genital portion strongly sclerotized and ornamented with a network of ridges, which is especially minute in middle portion. Ventri-anal portion reticulated, and with four pair of preanal and three perianal setae. Fixed digit of chelicera bidentate; movable digit (140  $\mu\text{m}$ ) unidentate and longer than spermatodactyl (98  $\mu\text{m}$ ). Tarsus I with vestigial claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli. Femur II with large thumb-like spur and two small spurs, genu II with two small spurs and tibia II with a small spur. Length of legs in the allotype: I 821  $\mu\text{m}$ , II 683  $\mu\text{m}$ , III 615  $\mu\text{m}$  and IV 780  $\mu\text{m}$ .

**Type series.** Holotype ♀ (NSMT–Ac 10417) and allotype ♂ (NSMT–Ac 10418), ex litter of warm temperate forest, Mt. Data, 2,300 m alt., Mountain Prov., Luzon Is., 25–VII–1985, K. ISHIKAWA. Paratypes: 4 ♀♀, 2 ♂♂, ex moss on rotten trees, Mt. Pangao, 2,300 m alt., nr. Mt. Data, Mountain Prov., Luzon Is., 26–VII–1985, K. ISHIKAWA.

**Remarks.** The dorsal shield is provided with 29 pair of setae in both the present species and *H. palawanensis* sp. nov., from the Olangan Valley, Palawan Is., but the former is discriminated from the latter by the following points: median extension of epistome elongated, instead of being short; middle portion of sternal shield minutely reticulated.

***Holaspulus palawanensis* sp. nov.**

(Figs. 5 A–G, 8 E)

**Female.** Length of idiosoma av. 601  $\mu\text{m}$ ; width of idiosoma av. 411  $\mu\text{m}$ ; length of dorsal shield with a range of 545–590  $\mu\text{m}$ , av. 568  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 305–382  $\mu\text{m}$ , av. 339  $\mu\text{m}$ ; light brown in colour.

**Dorsum.** Dorsal shield sclerotized and ornamented with reticulations, especially in the lateral and posterior portion. Dorsal shield bearing 29 pair of setae, which are spatulate distally except for long simple setae *z1*, and with 20 pair of pores. Length of setae (holotype): verticals 45  $\mu\text{m}$ , *j2* 46  $\mu\text{m}$ , *j3* 43  $\mu\text{m}$ , *j4* 43  $\mu\text{m}$ , *j5* 37  $\mu\text{m}$ , *j6* 41  $\mu\text{m}$ , *J1* 38  $\mu\text{m}$ , *J3* 22  $\mu\text{m}$ , *J5* 46  $\mu\text{m}$ , *z1* 32  $\mu\text{m}$  and humerals 57  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 5 A.

**Venter.** Tritosternum bipartite, with a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shields consisting of a pair of narrow platelets. Sternal shield sclerotized and reticulated, and provided with three pair of simple setae and two pair of lyrifishures. Metasternal shields fused with endopodal shields, and with a pair of simple setae and pores. Epigynial shield weakly reticulated, fused posteriorly with ventri-anal shield, and with a pair of simple setae. Ventri-anal shield reticulated, fused with epigynial, podal-peritrematal shields, and with four pair of

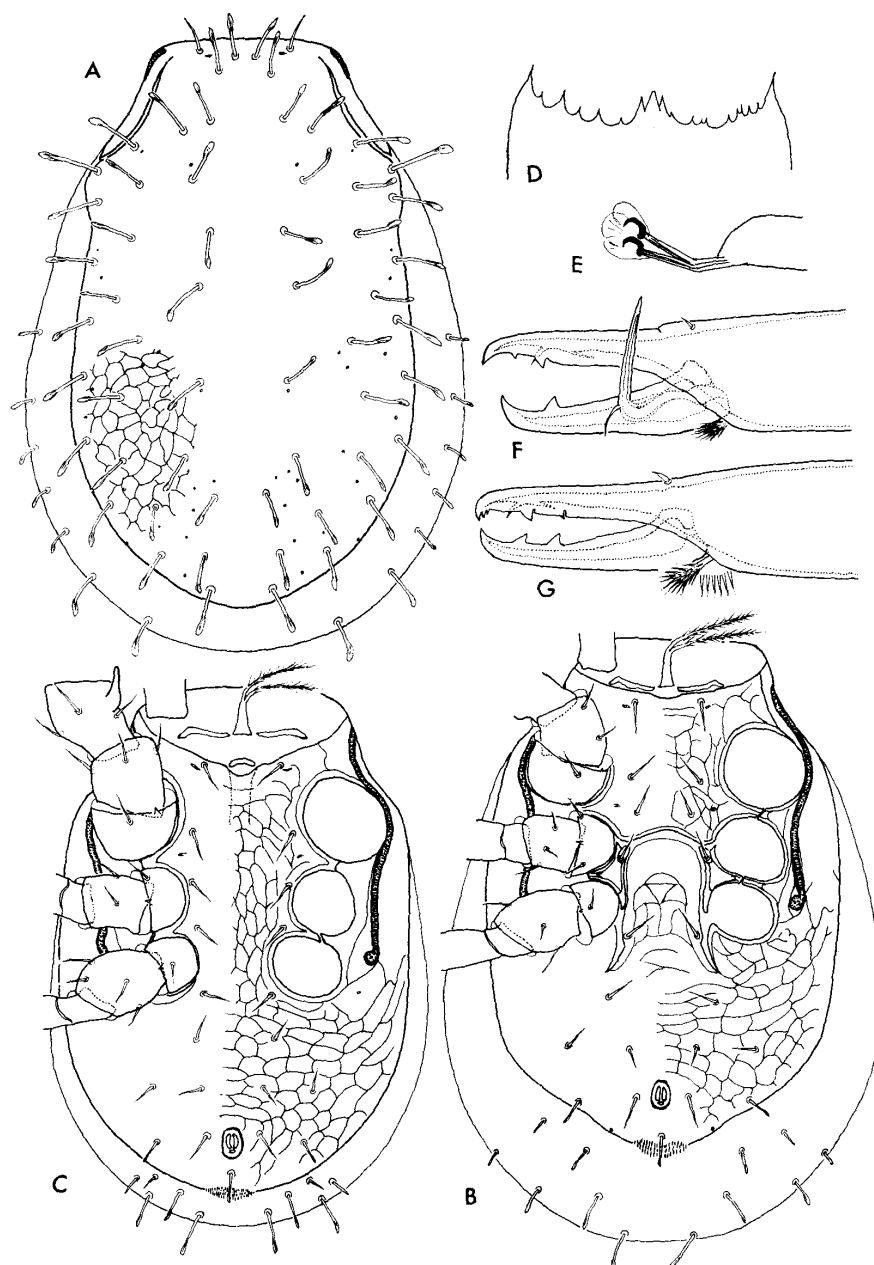


Fig. 5. *Holaspulus palawanensis* sp. nov. (A–B, D, G, female; C, E–F, male). — A, Dorsum; B–C, venter; D, epistome; E, claws of tarsus I; F–G, chelicera.

preanal setae and three perianal setae. Interscutal membrane between dorsal and ventral shields provided with thirteen pair of spatulate setae. Metapodal shields absent. Stigmata located lateral to coxae IV. Peritremes extending to coxae I.

Gnathosoma. Epistome trispinate, and with several short spines and a pair of lateral projections on either side. Palpal apotele provided with three tines, two of

which are spatulate distally. Fixed digit of chelicera bearing one large, three small teeth and a pilus dentilis, while movable digit ( $133\ \mu\text{m}$ ) is bidentate and longer than corniculus ( $106\ \mu\text{m}$ ). Salivary stylus ( $100\ \mu\text{m}$ ) well developed. Length of anterior hypostomatic seta  $73\ \mu\text{m}$ , external posterior hypostomatic seta  $39\ \mu\text{m}$ , internal posterior hypostomatic seta  $33\ \mu\text{m}$  and deutosternal seta  $29\ \mu\text{m}$ .

Legs. Tarsus I with neither claws nor pulvilli; tarsus I ( $170\ \mu\text{m}$ ) approximately twice the length of tibia I ( $84\ \mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae)  $560\ \mu\text{m}$ , II  $455\ \mu\text{m}$ , III  $408\ \mu\text{m}$  and IV  $535\ \mu\text{m}$ .

*Male.* Length of idiosoma av.  $501\ \mu\text{m}$ ; width of idiosoma av.  $343\ \mu\text{m}$ ; length of dorsal shield with a range of  $469\text{--}505\ \mu\text{m}$ , av.  $492\ \mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of  $285\text{--}330\ \mu\text{m}$ , av.  $313\ \mu\text{m}$ .

The chaetotaxy and ornamentation of dorsal shield are essentially the same as in the female. Holoventral shield reticulated, sterniti-genital portion provided with five pair of setae, ventri-anal portion with four pair of preanal and three perianal setae, all simple. Fixed digit of chelicera bidentate; movable digit ( $108\ \mu\text{m}$ ) unidentate and approximately twice as long as spermatodactyl ( $55\ \mu\text{m}$ ). Tarsus I provided with small claws and pulvilli, while tarsi II to IV each with well developed claws and pulvilli. Femur II with a large thumb-like spur, and genu II, tibia II, tarsus II each with a small spur. Length of legs in the allotype: I  $570\ \mu\text{m}$ , II  $458\ \mu\text{m}$ , III  $385\ \mu\text{m}$  and IV  $510\ \mu\text{m}$ .

*Type series.* Holotype ♀ (NSMT-Ac 10419) and allotype ♂ (NSMT-Ac 10420), ex litter of tropical rain forest, Olangan Valley, 50 m alt., between Puerto Princesa and Roxas, Palawan Is., 1-IX-1985, K. ISHIKAWA. Paratypes: 8 ♀♀, 7 ♂♂, same data as the holotype; 1 ♀, 2 ♂♂, ex litter of banana's stem, Matalangao, 50 m alt., nr. Roxas, Palawan Is., 27-VIII-1985, K. ISHIKAWA.

*Remarks.* The present species is closely allied to *H. epistomatus* sp. nov., from Mt. Data, Luzon Is., in the presence of 29 pair of setae on the dorsal shield, but is readily recognized on the following points: median extension of epistome short, instead of being elongated; middle portion of sternal shield not minutely reticulated.

### *Holaspulus luzonicus* sp. nov.

(Figs. 6 A-F, 8 F)

*Female.* Length of idiosoma av.  $700\ \mu\text{m}$ ; width of idiosoma av.  $553\ \mu\text{m}$ ; length of dorsal shield with a range of  $668\text{--}705\ \mu\text{m}$ , av.  $686\ \mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of  $490\text{--}542\ \mu\text{m}$ , av.  $525\ \mu\text{m}$ ; golden brown in colour.

Dorsum. Dorsal shield sclerotized and ornamented with reticulation, in the lateral and posterior portions. Dorsal shield bearing 28 pair of setae, which are spatulate distally except for long simple setae *z1*, and with 21 pair of pores. Length of setae (holotype): verticals *64*  $64\ \mu\text{m}$ , *j2*  $64\ \mu\text{m}$ , *j3*  $62\ \mu\text{m}$ , *j4*  $49\ \mu\text{m}$ , *j5*  $48\ \mu\text{m}$ , *j6*  $56\ \mu\text{m}$ , *J1*  $52\ \mu\text{m}$ , *J3*  $54\ \mu\text{m}$ , *J5*  $80\ \mu\text{m}$ , *z1*  $40\ \mu\text{m}$  and humerals  $91\ \mu\text{m}$ . The distribution of

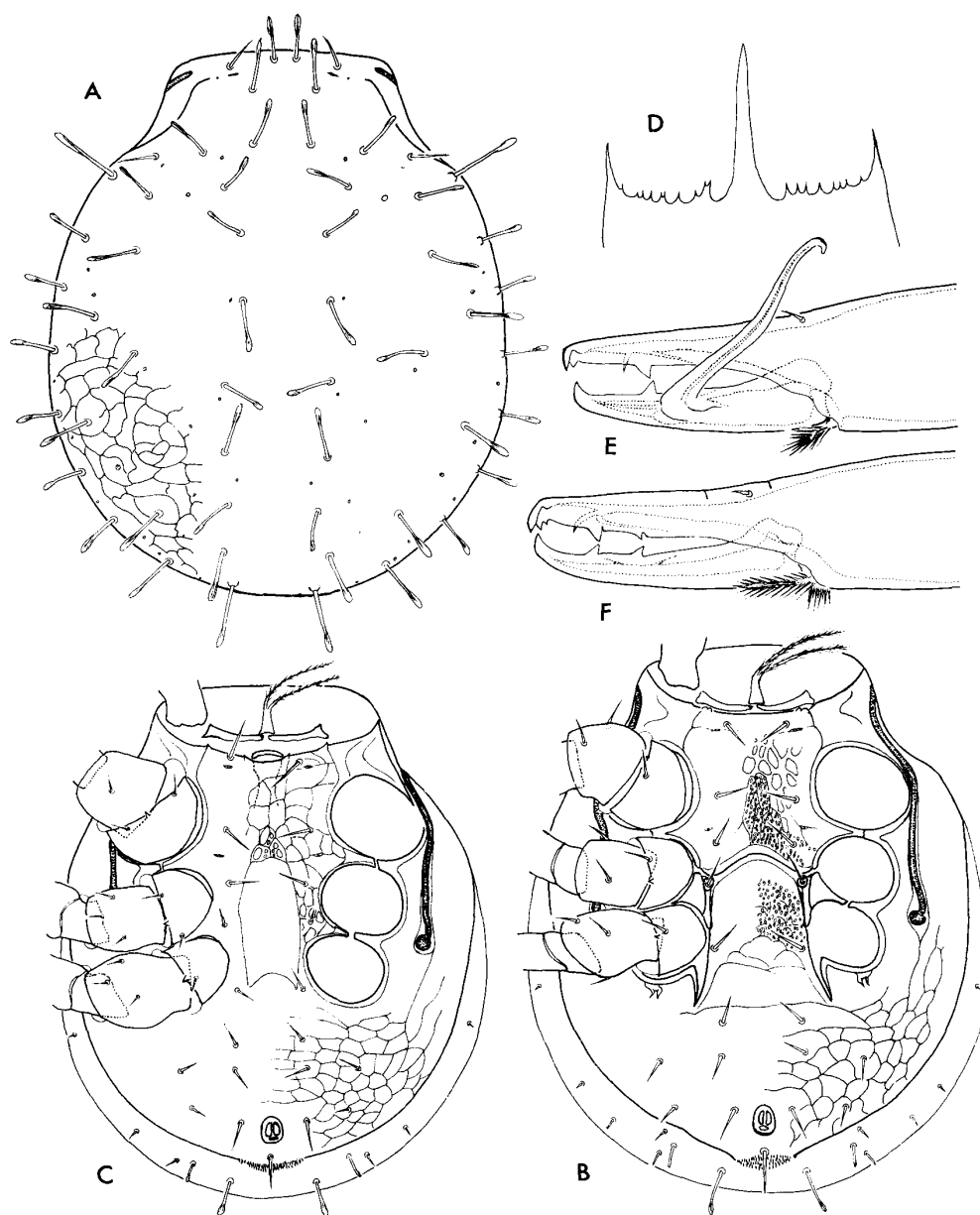


Fig. 6. *Holaspulus luzonicus* sp. nov. (A-B, D, F, female; C, E, male). — A, Dorsum; B-C, venter; D, epistome; E-F, chelicera.

setae and pores are as shown in Fig. 6 A.

**Venter.** Tritosternum bipartite, a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shields free, consisting of a pair of narrow platelets. Sternal shield heavily sclerotized and ornamented with a network of ridges, which are especially minute in middle portion, and with three pair of simple setae and two pair of lyrifissures. Metasternal shields partially fused with endopodal shields, and bearing a pair of simple setae and pores. Epigynial shield heavily sclerotized and orna-

mented with a network of ridges, fused posteriorly with ventri-anal shield, and with a pair of simple setae. Ventri-anal shield reticulated, fused with epigynial, podal-peritrematal shields, and with four pair of preanal setae and three perianal ones. A pair of expulsory vesicles situated behind coxae IV. Interscutal membrane between dorsal and ventral shields provided with seven pair of spatulate setae. Metapodal shields absent. Stigmata situated at a position antero-lateral to coxae IV. Peritremes extending to coxae I.

**Gnathosoma.** Epistome consisting of an elongate median extension, and with several short spines and elongated lateral projections on either side. Palpal apotele bearing three tines, two of which are spatulate distally. Fixed digit of chelicera provided with one large, three small teeth, and a pilus dentilis, while movable digit (150  $\mu\text{m}$ ) is bidentate and longer than corniculus (122  $\mu\text{m}$ ). Salivary stylus (117  $\mu\text{m}$ ) well developed. Length of anterior hypostomatic seta 108  $\mu\text{m}$ , external posterior hypostomatic seta 80  $\mu\text{m}$ , internal posterior hypostomatic seta 68  $\mu\text{m}$  and deutosternal seta 47  $\mu\text{m}$ .

**Legs.** Tarsus I with neither claws nor pulvilli; tarsus I (222  $\mu\text{m}$ ) more than twice the length of tibia I (95  $\mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae) 705  $\mu\text{m}$ , II 645  $\mu\text{m}$ , III 576  $\mu\text{m}$  and IV 738  $\mu\text{m}$ .

**Male.** Length of idiosoma av. 619  $\mu\text{m}$ ; width of idiosoma av. 493  $\mu\text{m}$ ; length of dorsal shield with a range of 598–622  $\mu\text{m}$ , av. 606  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 455–480  $\mu\text{m}$ , av. 467  $\mu\text{m}$ .

Dorsal chaetotaxy and ornamentation similar to those of female. Sterniti-genital portion heavily sclerotized and ornamented with a network of ridges, which is minute especially in the middle portion between sternal setae II to genital setae (sternal setae V). Ventri-anal portion reticulated, and with four pair of preanal and three perianal setae. Fixed digit of chelicera bidentate; movable digit (122  $\mu\text{m}$ ) unidentate and approximately as long as spermatodactyl (120  $\mu\text{m}$ ). Tarsus I without claws and pulvilli; tarsi II to IV each with well developed claws and pulvilli. Femur II with a large thumb-like and a small spurs, genu II and tibia II each with a small spur. Length of legs in the allotype: I (excl. sensory setae) 653  $\mu\text{m}$ , II 620  $\mu\text{m}$ , III 547  $\mu\text{m}$  and IV 716  $\mu\text{m}$ .

**Type series.** Holotype ♀ (NSMT-Ac 10421) and allotype ♂ (NSMT-Ac 10422), ex litter of warm temperate forest, Mt. Puguis, 2,000 m alt., Mountain Prov., Luzon Is., 18–VII–1985, K. ISHIKAWA. Paratypes: 8 ♀♀, 8 ♂♂, same data as holotype.

**Remarks.** The dorsal shield is provided with 28 pair of setae, and the tarsus I of male lacks claws and pulvilli in both the present species and *H. sclerus* sp. nov., from Mt. Data, Luzon Is., but the former is discriminated from the latter by the following points: median extension of epistome elongated, instead of being short; expulsory vesicles present, instead of being absent.

*Holaspulus sclerus* sp. nov.

(Figs. 7 A-F, 8 G)

*Female.* Length of idiosoma av. 858  $\mu\text{m}$ ; width of idiosoma av. 688  $\mu\text{m}$ ; length of dorsal shield 805, 815, 820  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV 620, 668, 680  $\mu\text{m}$ ; golden brown in colour.

*Dorsum.* Dorsal shield heavily sclerotized, and provided with 28 pair of setae,

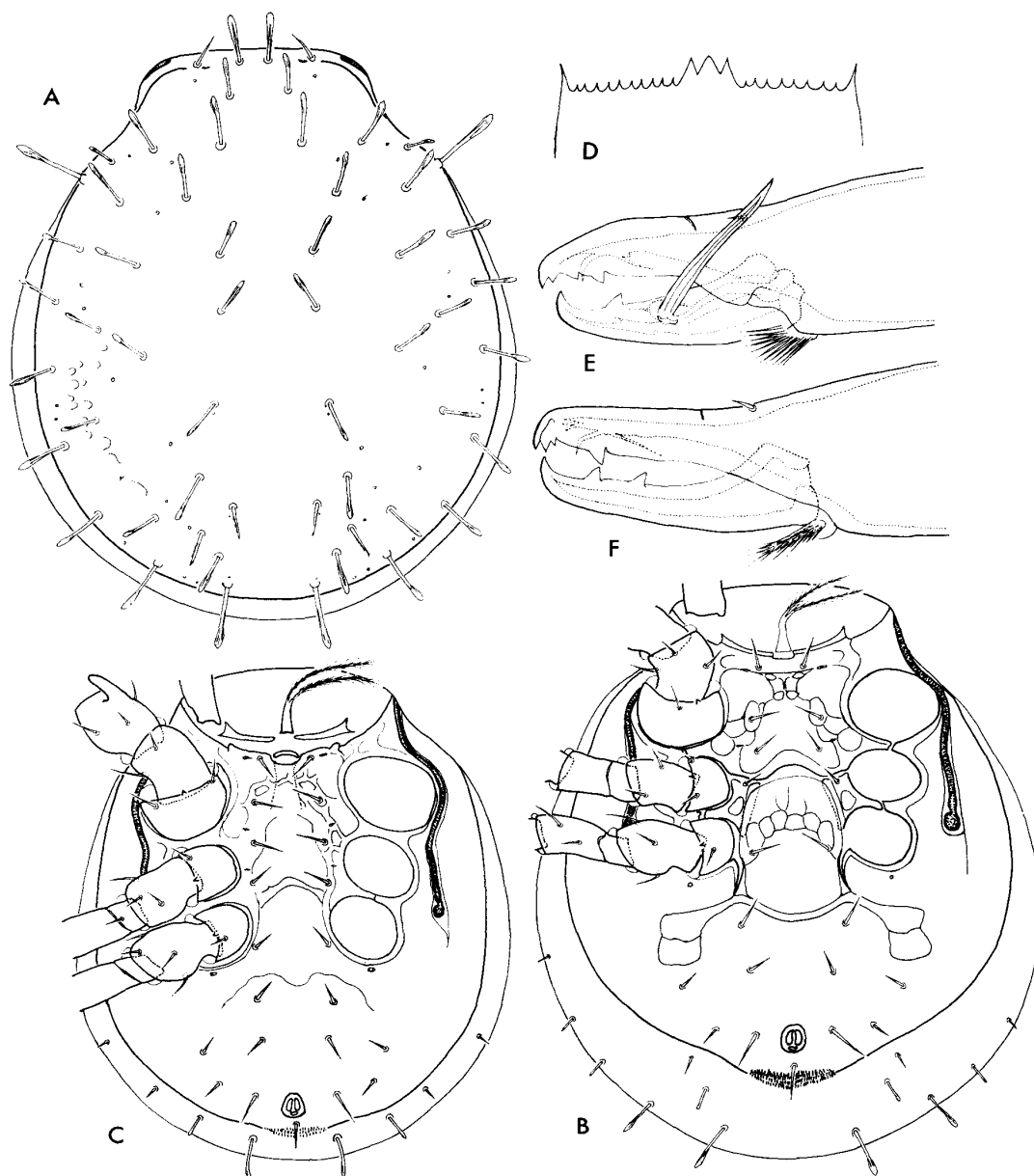


Fig. 7. *Holaspulus sclerus* sp. nov. (A-B, D, F, female; C, E, male). — A, Dorsum; B-C, venter; D, epistome; E-F, chelicera.



which are spatulate distally except for long simple setae *z1*, weakly setose *J3*, *J4*, and with 20 pair of pores. Length of setae (holotype): verticals 80  $\mu\text{m}$ , *j2* 69  $\mu\text{m}$ , *j3* 81  $\mu\text{m}$ , *j4* 73  $\mu\text{m}$ , *j5* 62  $\mu\text{m}$ , *j6* 65  $\mu\text{m}$ , *J1* 60  $\mu\text{m}$ , *J3* 48  $\mu\text{m}$ , *J6* 105  $\mu\text{m}$ , *z1* 37  $\mu\text{m}$  and humerals 107  $\mu\text{m}$ . The distribution of setae and pores are as shown in Fig. 7 A.

**Venter.** Tritosternum bipartite, a pair of pilose laciniae more than twice longer than tritosternal base. Presternal shields fused with sternal shield. Sternal shield heavily sclerotized and ornamented with a network of ridges except for smooth postero-middle portion, and provided with three pair of simple setae and two pair of lyrifissures. Metasternal shields completely fused with endopodal shields, and provided with a pair of simple setae and pores. Epigynial shield strongly sclerotized, anterior portion reticulated, fused posteriorly with ventri-anal shield, and with a pair of simple setae. Ventri-anal shield strongly sclerotized, fused with epigynial, podal-peritrematal shield, and provided with four pair of simple setae and three perianal setae. Interscutal membrane between dorsal and ventral shields bearing seven pair of spatulate setae. Metapodal shields absent. Stigmata located at a position antero-lateral to coxae IV. Peritremes extending to coxae I.

**Gnathosoma.** Epistome trispinate, with several short spines and a pair of lateral projections on either side. Palpal apotele provided with three tines, two of which are spatulate distally. Fixed digit of chelicera bearing one large, three small teeth and a pilus dentilis, while movable digit (165  $\mu\text{m}$ ) is bidentate and longer than corniculus (150  $\mu\text{m}$ ). Salivary stylus (146  $\mu\text{m}$ ) well developed. Length of anterior hypostomatic seta 102  $\mu\text{m}$ , external posterior hypostomatic seta 53  $\mu\text{m}$ , internal posterior hypostomatic seta 59  $\mu\text{m}$  and deutosternal seta 42  $\mu\text{m}$ .

**Legs.** Tarsus I without claws and pulvilli; tarsus I (238  $\mu\text{m}$ ) approximately twice the length of tibia I (117  $\mu\text{m}$ ). Tarsi II to IV each with well developed claws and pulvilli. Length of legs in the holotype: I (excl. sensory setae) 846  $\mu\text{m}$ , II 680  $\mu\text{m}$ , III 605  $\mu\text{m}$  and IV 792  $\mu\text{m}$ .

**Male.** Length of idiosoma av. 701  $\mu\text{m}$ ; width of idiosoma av. 597  $\mu\text{m}$ ; length of dorsal shield with a range of 673–730  $\mu\text{m}$ , av. 686  $\mu\text{m}$ ; width of dorsal shield at the level of coxae IV with a range of 550–631  $\mu\text{m}$ , av. 567  $\mu\text{m}$ .

Dorsal chaetotaxy and ornamentation are basically the same as in the female. Sterniti-genital portion strongly sclerotized and ornamented with a network of ridges, except for smooth postero-middle portion. Ventri-anal portion strongly sclerotized, and with four pair of preanal and three perianal setae. Fixed digit of chelicera bidentate, movable digit (123  $\mu\text{m}$ ) unidentate and longer than spermatodactyl (98  $\mu\text{m}$ ). Tarsus I with neither claws nor pulvilli; tarsi II to IV each with well developed claws and pulvilli. Femur II with a large thumb-like spur and a small spur, genu II with a large and a small spurs, tibia II and tarsus II each with a small spur. Length of legs in the allotype: I (excl. sensory setae) 835  $\mu\text{m}$ , II 738  $\mu\text{m}$ , III 655  $\mu\text{m}$  and IV 804  $\mu\text{m}$ .

**Type series.** Holotype ♀ (NSMT-Ac 10423) and allotype ♂ (NSMT-Ac 10424), ex litter of warm temperate forest, Mt. Data, 2,300 m alt., Mountain Prov., Luzon Is., 25–VII–1985, K. ISHIKAWA. Paratypes: 2 ♀♀, 7 ♂♂, same data as holotype; 1 ♀,

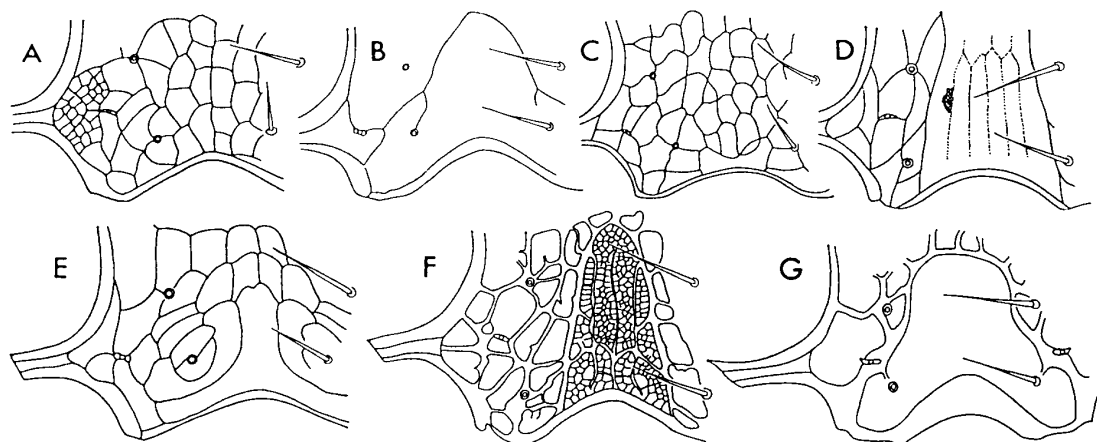


Fig. 8. Ornamentation of sternal shield of female. — A, *Holaspulus apoensis* sp. nov.; B, *H. primitivus* sp. nov.; C, *H. silvestris* sp. nov.; D, *H. epistomatus* sp. nov.; E, *H. palawanensis* sp. nov.; F, *H. luzonicus* sp. nov.; G, *H. sclerus* sp. nov.

ex litter of warm temperate forest, Mt. Pangao, 2,350 m alt., N Mt. Data, Mountain Prov., Luzon Is., 14–VII–1985, K. ISHIKAWA.

*Remarks.* The present species is closely related to *H. luzonicus* sp. nov., from Mt. Puguis, Luzon Is., in the dorsal shield bearing 28 pair of setae, and in the tarsus I of male lacking claws and pulvilli, but differs from the latter in the following points: median extension of epistome short, instead of being elongated; expulsory vesicles absent, instead of being present.

### References

- BERLESE, A., 1904. Acari nuovi Manipulus I. *Redia*, 1: 258–280.
- EVANS, G. O., 1956. On the classification of the family Macrochelidae with particular reference to the subfamily Parholaspinae (Acarina – Mesostigmata). *Proc. zool. Soc. London*, 127: 345–377.
- ISHIKAWA, K., 1969. Taxonomic investigations on free-living mites in the subalpine forest on Shiga Heights IBP Area I. Mesostigmata (Part 1). *Bull. natn. Sci. Mus., Tokyo*, 12: 39–64.
- 1979. Taxonomic and ecological studies in the family Parholaspidae (Acari, Mesostigmata) from Japan (Part 1). *Ibid.*, (A), 5: 249–269.
- 1987. Occurrence of *Proparholaspulus* (Acarina, Parholaspidae) in the Philippines. *Ibid.*, 13: 79–84.
- KRANTZ, G. W., 1960. A re-evaluation of the Parholaspinae Evans 1956 (Acarina: Mesostigmata: Macrochelidae). *Acarologia, Paris*, 2: 393–433.